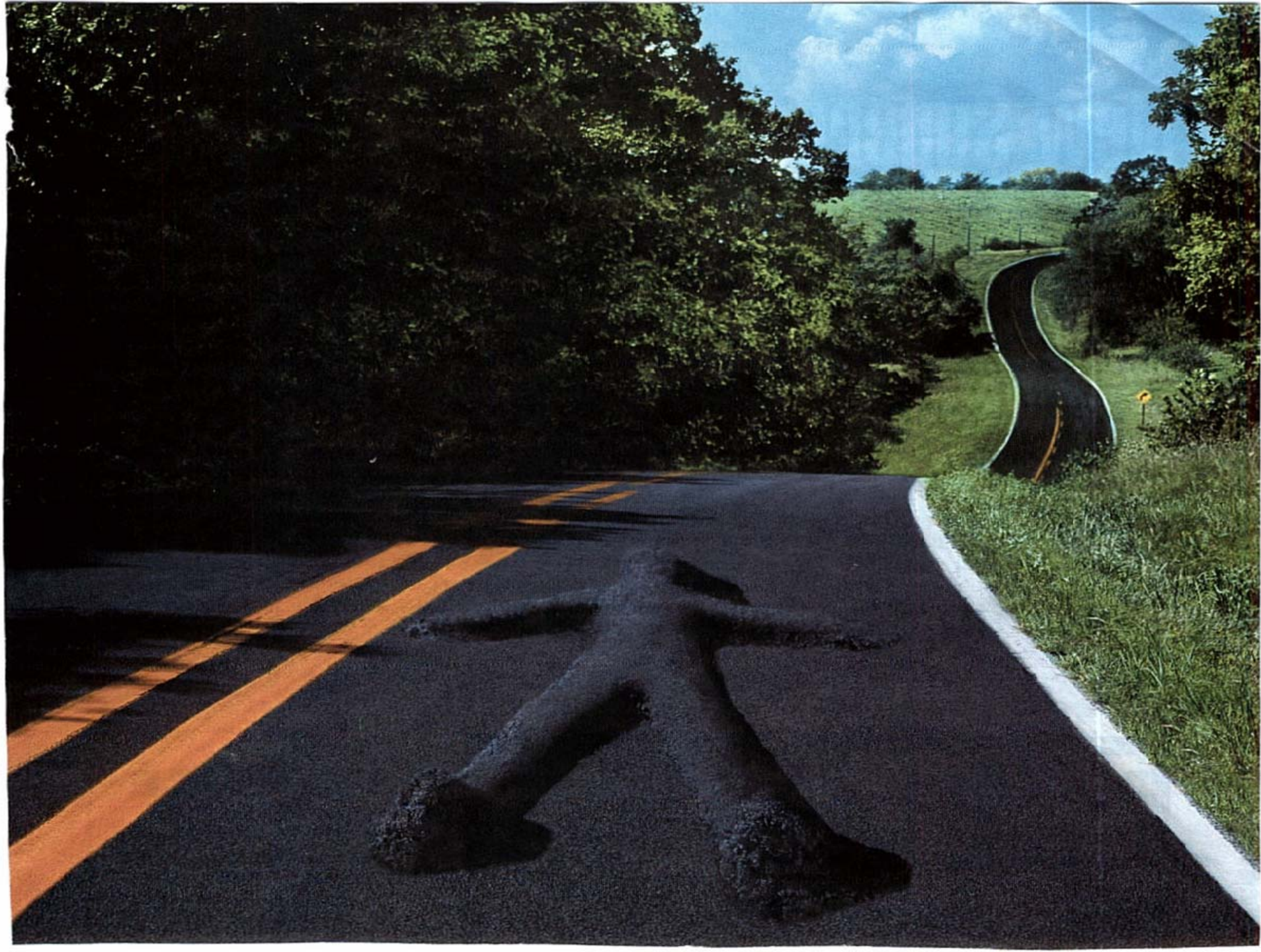
GREEN HIGHWAYS PARTNERSHIP

Stewardship, Safety & Sustainability

Denise M. Rigney
US EPA Region III
April 8, 2008



Describing the Green Highways Partnership

- **Broad Based Partnership**
- **Leveraging of *Knowledge*, *Experience*, & *Resources***
- **Doing Business *Differently***
- **Leaving Things *Better Than Before***

Partnership

Academia

UMD
UWISC
UC
Villanova
UVT
CP Tech Center @ Iowa State U.

TRB
ASCE – T&DI
NEMWI

Industry &Trade Associations

ACAA
SCA
NRMCA
FIRST
NCASI
NAPA
IRC
RMA
ACPA
CMRA
NSA

Government

Federal

USEPA
FHWA
USFWS
USACE

State

MSHA
DCDOT
DELDOT
PENNDOT
NYDOT
NJDOT
WVDOT
MDE
VADNR
DNRC
PADEP
NYDEC
VDEQ

Environmental NPO's

Low Impact Development Center
American Forestry
Conservation Fund
MD Coastal Bays
DELEP

Counties & Municipalities

Prince Georges, Baltimore, Fairfax, Arlington

Goal

To *promote market-driven innovation, stewardship, streamlining, and regulatory consistency & flexibility.*

Mission

Meet transportation requirements and apply environmental stewardship so that both are better than before.

Tools

Partnerships

Rewards & Recognition

Opportunities

GHP Structure

Ad Hoc Committee

Watershed Based Stormwater Management Team

Promote the watershed-driven address of stormwater impacts through the use of practices that eliminate flow and loads by 90-100% and allow for innovative approaches to stormwater and watershed trading.

Recycle & Reuse of Industrial Byproducts

- **Promote environmentally sound and technically acceptable use of industrial materials in the transportation infrastructure**
- **Promote practices that conserves non-renewable resources thereby reducing impact to landfills, reducing greenhouse gas emissions, and saving energy**

Conservation & Ecosystem Protection Team

Establish a Regional Ecosystem Framework

Develop Conservation Ecosystem approaches focused for Transportation

GHP Highlights

Ad Hoc Committee

- ✓ *Annual GHP Recognition Program & Leadership Forum*
- ✓ *American Society of Civil Engineers Partnership Coordination*
- ✓ *American Assoc of State & Highway Transportation Officials Partnership Coordination*
- ✓ *HQ OWOW Transportation Liaison to provide support for GHP*
- ✓ *HR 5161 Green Transportation Infrastructure Research and Technology Transfer Act*
- ✓ *Outreach & Communication*

GHP Highlights

Watershed Based Stormwater Management Team

- ✓*NMRCA/EPA Stewardship Agreement*
- ✓*Watershed Resource Registry (US 301 pilot)*
- ✓*Green credits for Green Highways*
- ✓*GHP Fact Sheets - 8*
- ✓*RARE project – Use of Slag to Reduce P Loadings*
- ✓*Training & Certificate Program in Integrated GHP, GI and Watershed Driven Stormwater Mngmt.*
- ✓*GHP Collective Environmental Management Systems (CEMS) Approach*
- ✓*County Partnering – Green Highways & Green Streets*
  Next Partner – Montgomery County Md.
- ✓*AASHTO Partnering on WRR pilot & Chesapeake Bay effort.*
- ✓*GHP University Stormwater Blog*
- ✓*Joint Workshop on Stormwater Management – Approaches & Permitting*

GHP Highlights

Conservation & Ecosystem Management Team

- ✓ ***Strategic Conservation Transportation Plan for the Northern Tier Regional Planning Organization***
  - ✓***Bradford, Sullivan, Susquehanna, Tioga & Wyoming Counties in PA***
    - ✓***Uses green infrastructure assessment approaches***
    - ✓***To identify critical habitats and other areas of ecological importance***
    - ✓***To facilitate the placement, design, and scope of future transportation projects.***

GHP Opportunity?

HR 5161 Green Transportation Infrastructure Research and Technology Transfer Act

Generate innovative and cost-effective approaches to mitigating environmental impacts throughout the lifecycle of transportation infrastructure;

Promote adoption of innovative green transportation infrastructure systems by state and local governments and the private sector; and

Manage technology transfer programs to disseminate information on best management practices in the area of green transportation infrastructure to state and local governments and the private sector.

"EPA and the Department of Transportation are working together to advance common goals and protect watersheds, such as our Green Highways partnership in the Mid-Atlantic region. The growing emphasis on green transportation infrastructure will be key to meeting our ambitious goals for protecting wetlands and managing stormwater." Ben Grumbles

Leveraging…..

- Knowledge
  - ACPA, Villanova Research
- Experience
  - Maryland SHA
  - District of Columbia DOT
  - Prince Georges County
- Resources – EPA & FHWA $$$
  - Anacostia Watershed Grants
    - District of Columbia
    - Prince Georges County
  - EPA ORD - RARE Project
    - Use of Steel Slag to remove P

CONCRETE Information

ACPA
AMERICAN CONCRETE PAVEMENT ASSOCIATION

Stormwater Management with Pervious Concrete Pavement

Pervious Concrete Pavement

Description

Pervious concrete pavement is a permeable pavement, often with an underlying stone reservoir, that captures rainfall and stores runoff before it infiltrates into the subsoil. This pervious surface replaces traditional pavement, allowing stormwater to infiltrate directly, permitting a naturally occurring form of water treatment. Pervious concrete consists of specially formulated mixtures of hydraulic cementitious materials, uniform open graded coarse aggregate such as ASTM C-33 #8 or #89 (3/8 inch) (10 mm), #67 (3/4 inch) (19 mm), to #5 or #56 (1 inch) (25 mm), and water. When properly designed and installed, pervious concrete has a high percentage of void space (15% or more) which can accommodate stormwater from any significant storm event (see Figure 1).

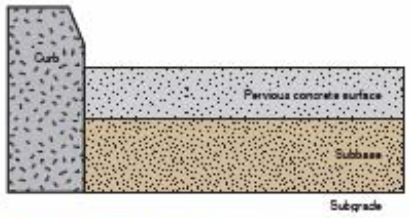


Figure 1. Typical cross-section of pervious concrete pavement. On level subgrades, stormwater storage is provided in the pervious concrete surface layer (15% to 25% voids), the subbase (20% to 40% voids), and above the surface to the height of the curb (100% voids). Source: Tennis, et al, 2004, adapted from Paine 1990.

Application

The ideal application for pervious concrete pavement is around buildings (walkways, courtyards, etc.) and parking areas, as well as low-volume roadways. Pervious concrete pavement may also have some application on highways, where it could be used in shoulder and median construction for stormwater runoff mitigation. There may also be application for its use as a surface material to reduce hydroplaning, splash and spray, and mitigate tire-pavement noise.

Regional Applicability

Pervious concrete pavement can be applied in most regions of the country, but the practice has unique challenges in cold climates. Design of the system should ensure that washout from adjacent (soil) areas is not allowed to drain onto the pervious concrete surfaces. Care should be taken with regard to sand being applied to the pavement surface for deicing, as the sand may become lodged into the surface of the material. This difficulty does not imply that it is impossible to use pervious concrete pavement in cold climates. Anecdotal evidence suggests that snow-covered pervious concrete pavement may actually clear more quickly than impervious surfaces, reducing the need for snow plowing. Additionally, melted snow will drain through the pervious concrete pavement rather than ponding and refreezing as is common with traditional impervious pavements. This may minimize the need to apply deicing materials to the pervious concrete pavement.

Another concern in cold climates is that infiltrating runoff below the pavement may cause frost heave, although design modifications that provide for an

Green Highways

Environmentally and Economically Sustainable Concrete Pavements

concrete pavement research and technology *special report*

Contents

ACPA
American Concrete Pavement Association

October 2007

Introduction

The concepts of "sustainability" and "sustainable development" are receiving much attention as the causes of global warming and climate change are debated. The World Commission on Environment and Development has defined sustainable development as "meet[ing] the needs of the present without compromising the ability of future generations to meet their own needs" (report to the United Nations General Assembly, August 1987).

In 2005, the U.S. Environmental Protection Agency (EPA) started the Green Highways Initiative as an instrument for coordinating transportation and environmentalism. According to this initiative, "green highways" are those that are environmentally responsible and sustainable in all aspects, including design, construction, and maintenance.

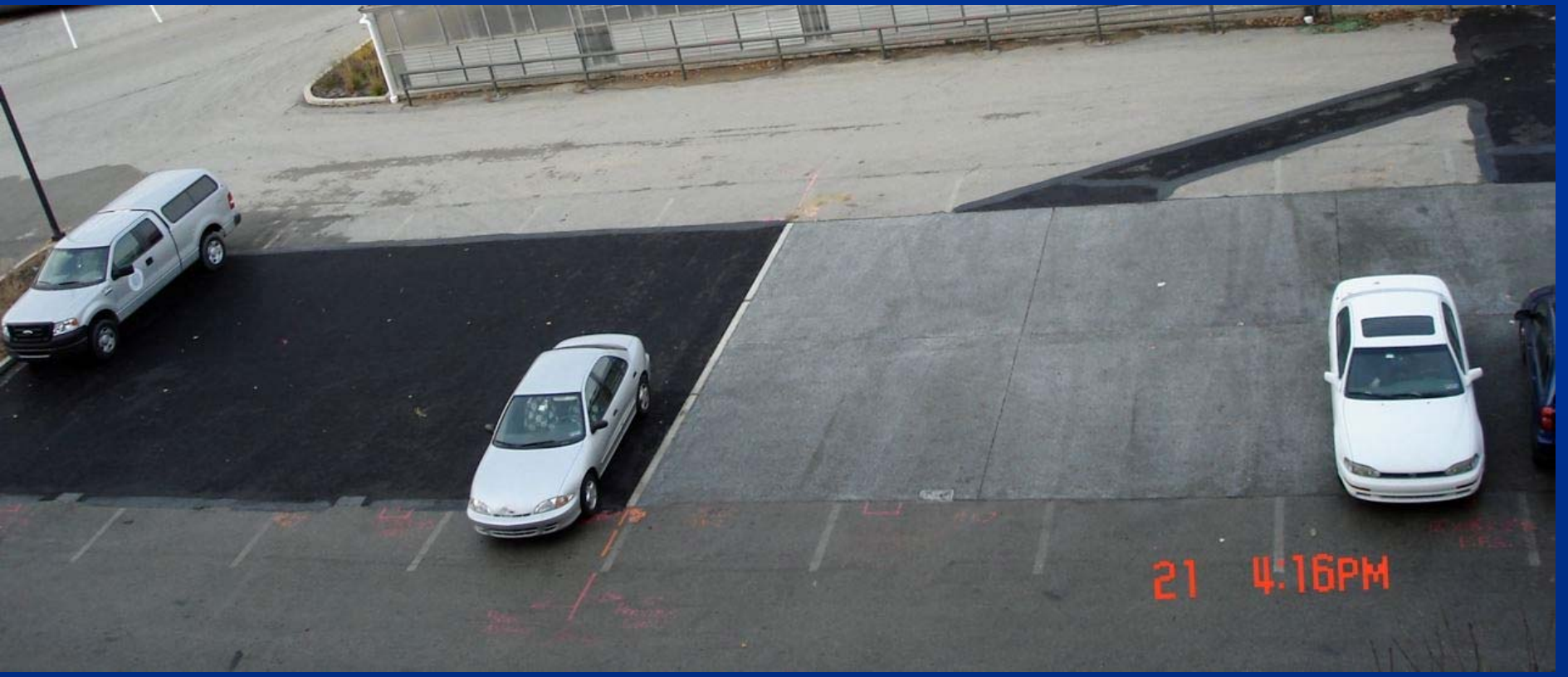
A major focus of the initiative is to demonstrate and ensure that sustainable practices in pavements can go hand in hand with economic success. This is indeed true of concrete pavements.

Particularly because of its long life, concrete is an economical, cost-effective pavement solution that consumes minimal materials, energy, and other resources for construction, maintenance, and rehabilitation activities over its lifetime. Beyond longevity, other features of concrete pavement further enhance its sustainability:

- Properly constructed and textured concrete pavements have reduced pavement deflection, which results in reduced vehicle fuel consumption.
- The construction of concrete pavements consumes less fuel (particularly diesel) during materials production, transportation, and placement than the construction of asphalt pavements.
- Concrete pavement mixtures incorporate industrial byproducts (i.e., fly ash and slag cement), which lowers the disposal needs, reduces the demand on virgin materials, and conserves natural resources.
- Concrete pavement itself is renewable and 100% recyclable.
- Concrete pavement requires less subbase aggregate materials for structural support than asphalt pavements.
- Concrete pavements' lighter color and increased reflectivity improve nighttime visibility, reduce the amount of power needed to illuminate roads at night, and help mitigate urban heat island and smog generation.
- Concrete pavements exhibit a lower energy footprint associated with their production, delivery, and maintenance than asphalt pavements do over a predetermined time period.
- Concrete pavements designed with pervious concrete shoulders minimize surface-water discharge and help replenish groundwater aquifers.
- Optimized concrete pavement surface textures produce quieter pavements over longer periods of time, reducing noise pollution.

Although cement is a relatively energy-intensive and carbon dioxide (CO_2)-intensive material to manufacture, it is important to recognize that cement manufacturing accounts for only 1.5% of

Determining the parameters of Pervious/Porous Pavements for input into a BMP BMP Decision Support Tool (model)

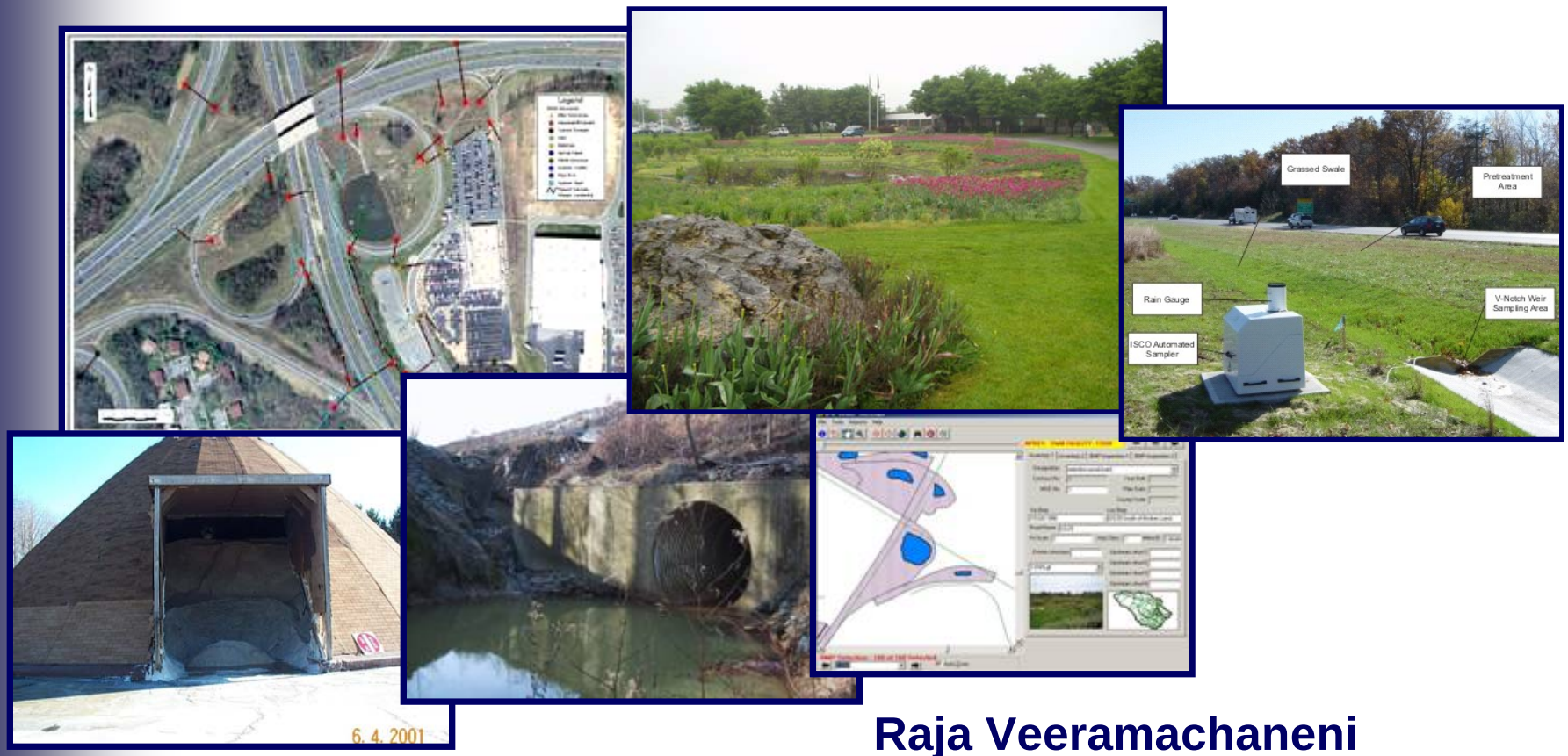


Leveraging…..

- Experience
  - Maryland SHA
  - District of Columbia DOT
  - Prince Georges County

Maryland Department of Transportation
State Highway Administration

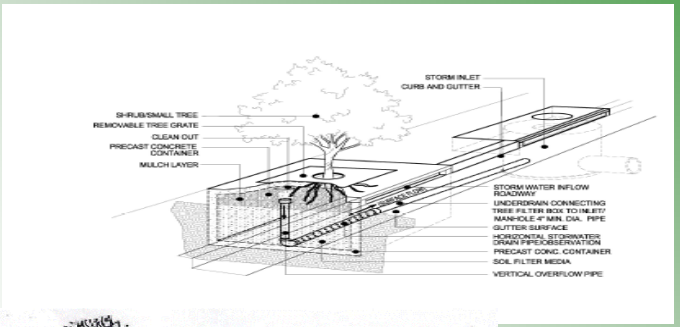
Green Highways: *A Watershed Approach to Stormwater Management*

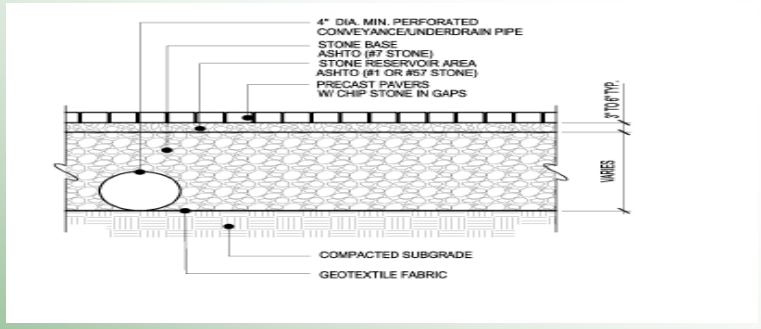


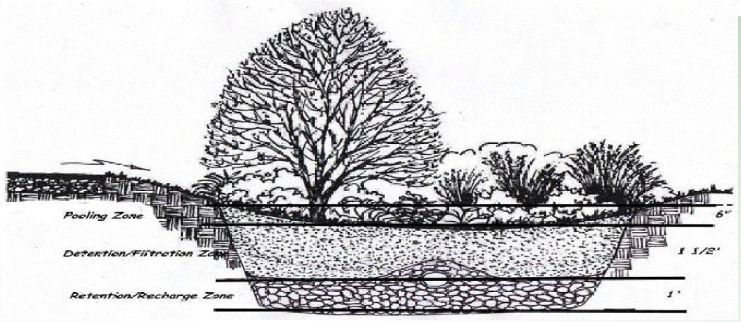
Raja Veeramachaneni
Director, Office of Planning and Preliminary Engineering

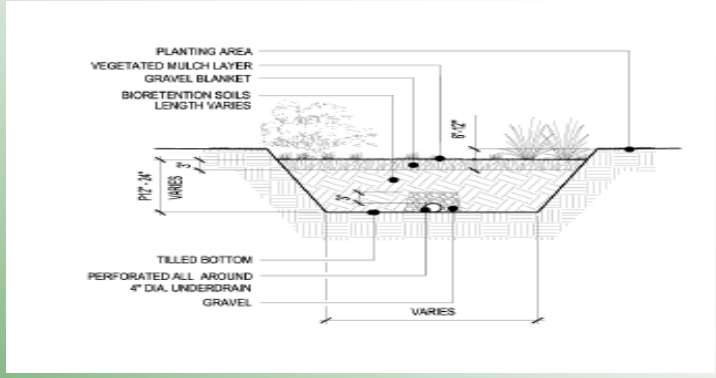
DDOT LID Standards

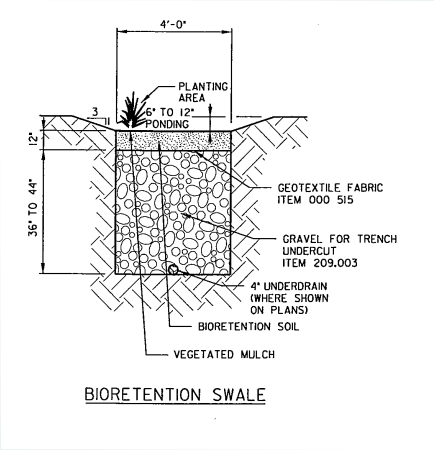
- Update Requirements
- Monitoring & Technology Assessment
- Maintenance Programs











Gateway Projects (Green Highway Program)

To improvement water quality by retrofitting the highway median and interchanges

To demonstrate how LID techniques can treat stormwater pollutants generated by highway traffic

Leveraging…..

- Resources – EPA & FHWA $$$
  - Anacostia Watershed Grants
    - District of Columbia
    - Prince Georges County
  - EPA ORD Research (RARE)
    - Use of Steel Slag to remove Phosphorus from stormwater
  - Other EPA Grant Funds
    - Villanova Study – Clean Water Act Sec. 319 $
    - Water Quality Demonstration Grants

Restoring the Legacy

District Department of Transportation

Peace Cross Green Highway

Use of Slag for Phosphorus Removal

Pictures from Presentation by:
Aleksandra Drizo, Ph.D
University of Vermont,, Plant & Soil Science Department

Use of Slag for Phosphorus Removal

Steel Slag Filter Cells
(parking lot concrete repaving by Virginia Tech Foundation)

Pictures from Presentation by:
Aleksandra Drizo, Ph.D
University of Vermont,, Plant & Soil Science Department

Doing Business Differently….

- **EPA grant funds awarded to DOTs**
- **Working to break down regulatory silos within EPA and other Regulatory Agencies**
  - ***Watershed Resource Registry Pilot***
- **Increasing regulatory predictability & flexibility**
  - ***Corporate Stewardship Agreements***
  - ***CEP Team Strategic Conservation Assessments for Transportation***

Watershed Resource Registry (WRR)

A unique tool to integrate Planning, Mitigation and Sustainable Development

A blueprint for transitioning from a single program-based approach to an integrated (multi-program) watershed systems approach allowing for greater integration and coordination among regulatory requirements and resource protection efforts.

GHP Highlights

NMRCA/EPA Stewardship Agreement

FACT SHEET

The Environmental Protection Agency, Mid-Atlantic Region, and the National Ready Mixed Concrete Association have signed a Memorandum of Agreement to work together to promote Environmental Management "tools" to assist ready mixed concrete plants across the country in their efforts to comply with Clean Water Act obligations. This Agreement also serves to further the "beyond compliance" principles of environmental stewardship embraced by the Green Highways Partnership (GHP).

Principles of Environmental Stewardship

Top Management Commitment: Make substantive top management commitments to sustainable development and improved environmental performance.

Compliance Assurance: Implement environmental auditing, assessment and improvement programs to identify and correct potential compliance problems.

Compliance Assistance: Develop and foster implementation of environmental management systems, like the NRMCA Green-Star™ Certification Program, which provide a framework for ensuring for ensuring compliance.

Measurement and Continuous Improvement: Develop goals and measures of environmental performance to demonstrate adherence to these environmental stewardship principles.

Public Communications: Make information available to the public on environmental performance and establish a dialog with agencies and the public on environmental issues.

Industry Leadership: Work with other companies in the same region or sector to improve industry-wide environmental compliance, pollution prevention practices, and energy efficiency.

Awareness, outreach: Work cooperatively to ensure that increased awareness is achieved through proactive outreach and communication initiatives.

Training and development: Identify key training needs, develop programs, and provide training programs to support environmental compliance and achieving "beyond compliance" goals.

Research and Demonstration: Coordinate and conduct key research and development initiatives to increase innovation and solutions and verify performance results on products and processes.

NRMCA™

agreement of environmental stewardship

Between the US EPA and the National Ready Mixed Concrete Association

GHP Highlights

Strategic Conservation Transportation Plan for the Northern Tier Regional Planning Organization

- ✓Bradford, Sullivan, Susquehanna, Tioga & Wyoming Counties in PA
  - ✓Uses green infrastructure assessment approaches
  - ✓To identify critical habitats and other areas of ecological importance
  - ✓To facilitate the placement, design, and scope of future transportation projects.

"Better Than Before"….

Green Highway "Characteristics"

- Provides net increase in environmental functions and values of the watershed
- Goes beyond minimum standards set forth by environmental laws and regulations
- Identifies and protects important historical and cultural landmarks
- Maps all resources in the area in order to identify, avoid, and protect critical resource areas
- Uses innovative, natural methods to reduce imperviousness, and cleanse all runoff within the project area
- Maximizes use of existing transportation infrastructure, provides multi-modal transportation opportunities, and promotes ride-sharing / public transportation
- Uses recycled materials to eliminate waste and reduce the energy required to build the highway
- Links regional transportation plans with local land use through partnerships
- Controls populations of invasive species, and promotes the growth of native species
- Incorporates post project monitoring to ensure environmental results
- Protects the hydrology of wetlands and streams channels through restoration of natural drainage paths
- Results in a suite of targeted environmental outcomes based upon local environmental needs
- Reduces disruptions to ecological processes by promoting wildlife corridors and passages in areas identified through wildlife conservation plans
- Encourages smart growth by integrating and guiding future growth and capacity building with ecological constraints

EXAMPLES OF GREEN HIGHWAY PRACTICES

1. Bioretention
2. Porous Pavements
3. Environmentally Friendly Concrete
4. Forest Buffers
5. Restored and Stormwater Wetlands
6. Stream Restoration
7. Wildlife Crossings
8. Soil Amendments
9. Diesel Hook-Ups
10. 100-Yr Pavements
11. Use of Recycled/Reclaimed Materials
12. Cool Pavements
13. Alternative Bio-Fuels

GHP in Publication

Number One Goal of Green Highways – Leave the Environment Better Than Before

"Meet transportation requirements and apply environmental stewardship so that both are better than before." (AASHTO, *Above and Beyond 2008)*

Green Highways Partnership Highlighted in Executive Order 13274 Annual Report to President

BNA, Inc. Transportation / Environment Alert Volume 10, Issue 19 Jan. 18, 2008
Officials Honored For Contributions To Green Highways Partnership

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